

WHAT IS CLAIMED IS:

1. A multiple node network comprising a management node, a plurality of terminal nodes, and a bus arranged to connect and provide communication among the terminal nodes and the management node, the management node sending an individual information transfer demanding frame to each terminal node, at least one terminal node adapted to respond to the management node with an individual information response frame, the management node adapted to allocate a network address to each terminal node through a network address notification frame, at least one terminal node capable of allocating an arbitrary network address upon receiving no allocated network address from the management node when the terminal node is attempting to join the network and the terminal node determining that the management node has a fault, the arbitrary network address being converted to a network address by the terminal node when no other terminal node has a network address identical to the arbitrary address.

2. The network as set forth in Claim 1, wherein at least one terminal node communicates with an engine electronic control unit, the engine electronic control unit configured to control at least one component of an engine of a vehicle.

3. The network as set forth in Claim 2, wherein the vehicle is a personal watercraft.

4. The network as set forth in Claim 2, wherein the vehicle is a boat.

5. The network as set forth in Claim 1, wherein at least one terminal node communicates with at least one sensor that monitors an operating condition of an engine.

6. The network as set forth in Claim 1, wherein at least one terminal node communicates with an actuator of an engine.

7. The network as set forth in Claim 1, wherein the arbitrary network address is converted to a network address by the terminal node when a predetermined amount of time has elapsed.

8. The network as set forth in Claim 1, wherein the management node comprises an information transfer unit that transmits an information transfer demanding frame to at least one terminal node, a network address unit that transmits the network address notification frame to the terminal nodes, and the at least one terminal node comprising an individual information unit that transmits an individual information response frame to the management node.

9. The network as set forth in Claim 1, wherein the at least one terminal node sends out a different arbitrary address when another terminal node is already using

a network address that is identical to the arbitrary network address initially allocated by at least one terminal node.

10. The network as set forth in Claim 1, wherein each one of the terminal nodes communicates with the management node to obtain under normal operations a network address from the management node.

11. The network as set forth in Claim 1, wherein each one of the terminal nodes belongs to a component of a system, each component having a unique identification code.

12. The network as set forth in Claim 11, wherein the identification code contains an identifier that is selected from a group of component identifiers consisting of a product code, a part code, a manufacturing code and a manufacturer model code of the component.

13. The network as set forth in Claim 11, wherein each identification code includes information that sets a communicating hierarchy among the various components that communicate via the network.

14. The network as set forth in Claim 11, wherein the system is a vehicle, one of the components is a drive unit of the vehicle, and the identification code contains a parts code, a manufacturing code or a manufacturer model code of the drive unit or a member related to the drive unit.

15. A communication method between a plurality of nodes in a network, the nodes including terminal nodes and a management node configured to at least initially manage the terminal nodes, the method comprising the management node sending an individual information transfer demanding frame to one or more of the terminal nodes, the one or more terminal nodes responding to the management node with an individual information response frame, the management node allocating a network address the responding terminal node through a network address notification frame, at least one of the terminal nodes applying an arbitrary address upon detection that the management node has a fault when a terminal node is trying to join the network, converting the arbitrary address to an operating network address when no response from the management node is received and no other terminal node has been assigned the arbitrary address.

16. The communication method as set forth in Claim 15, wherein the management node fault is determined when the terminal node does not receive the allocated network address frame from the management node.

17. The communication method as set forth in Claim 15, wherein the arbitrary address is selected from a sequential order located in an address memory list, the arbitrary address being selected from one half of the sequential order.

18. A communication method between a plurality of nodes in a network, the nodes including terminal nodes and a management node configured to assign network addresses to each of the terminal nodes in normal operation, the method comprising:

determining a failure by the management node to assign a network address to one of the terminal nodes;

selecting an arbitrary network address for said one terminal node;

determining whether the arbitrary network address is identical to a network address currently used by one of the other terminal nodes; and

using the arbitrary network address as the network address for said one terminal node if the arbitrary network address is not identical to a network address used by one of the other terminal nodes.

19. The communication method of Claim 18 additionally comprising selecting another arbitrary network address if the first selected arbitrary network address is identical to a network address used by one of the other terminal nodes, determining whether said another arbitrary address is identical to a network address currently used by one of the other terminal nodes, and using said another arbitrary address as the network address for said one terminal node if the arbitrary network address is not identical to a network address used by one of the other terminal nodes.

20. The communication method of Claim 19, wherein selecting another arbitrary network address involves incrementally decreasing the first selected arbitrary network address.

21. The communication method of Claim 18, wherein determining a failure of the management node involves sending an individual information response frame to the management node and determining that a predetermined time period has elapsed without receiving a response from the management node.

22. The communication method of Claim 21, wherein the management node failure is determined when no response is received from the management node after sending a plurality of individual information response frames to the management node and waiting the predetermined time period after sending each individual information response frame.

23. The communication method of Claim 18, wherein the arbitrary network address is selected from an address list stored in memory in said terminal node.

24. The communication method of Claim 23, wherein the arbitrary address is selected from one half of a list of network addresses arranged in sequential order.

25. The communication method of Claim 18, wherein determining whether the arbitrary network address is identical to a network address used by another terminal node involves sending an address application frame to the network and waiting for a response.

26. The communication method of Claim 25, wherein the arbitrary network address is used as the network address for said terminal node if no response is received within a predetermined time period from any of the other terminal nodes on the network.

27. The communication method of Claim 18 additionally comprising communicating data to the network through one of the terminal nodes, wherein such data is indicative of an operating condition of an engine.

28. The communication method of Claim 18 additionally comprising communicating data to the network through one of the terminal nodes, wherein such data is indicative of an operating condition of a vehicle.

29. A communication system for a vehicle comprising an engine, at least one sensor detecting an operating condition of the vehicle, and a network having a plurality of terminal nodes and a management node, at least one terminal node communicating with the engine and at least another one of the terminal nodes communicating with at least the sensor, the management node adapted to assign a network address to each terminal node when the terminal node is attempting to join the network, each terminal node capable of determining whether the management node has failed to assign the terminal node a network address and assigning itself a network address that is not currently used by any other terminal node active on the network.

30. A communication system for a vehicle as set forth in Claim 29, wherein each terminal node is configured to send an address application frame to the network that contains an arbitrary network address when the management node has failed to assign the terminal node a network address, to wait receipt of a response frame from another terminal node active on the network, and to set the arbitrary address as its network address when the terminal node does not receive a response frame from any of the other terminal nodes active on the network.

31. A communication system for a vehicle as set forth in Claim 30, wherein each terminal node is further configured to re-transmit the address application frame containing a different arbitrary network address when the terminal node receives a response frame from one of the other terminal nodes in response to a prior address application frame sent by the terminal node.

32. A communication system for a vehicle as set forth in Claim 30, wherein each terminal node is configured to select randomly the arbitrary network address from a list of network addresses stored in a memory of the terminal node.

33. A communication system a vehicle as set forth in Claim 30, wherein each terminal node is configured to select the arbitrary network address from one half of a sequential list of network addresses stored in a memory of the terminal node.

34. A communication system for a vehicle as set forth in Claim 29, wherein each terminal node is configured to generate and transmit a response frame to the network when the terminal node receives an address application frame from another terminal node that contains an arbitrary address identical to the network address of the terminal node that received the address application frame.